# SECTION SC

# STARTING & CHARGING SYSTEM



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# PRECAUTIONS

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## Precautions for Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER"

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The Supplemental Restraint System such as "AIR BAG" and "SEAT BELT PRE-TENSIONER", used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. Information necessary to service the system safely is included in the SRS and SB section of this Service Manual.

**WARNING:**

- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see the SRS section.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harnesses or harness connectors.**

# PREPARATION

PFP:00002

## Special Service Tools

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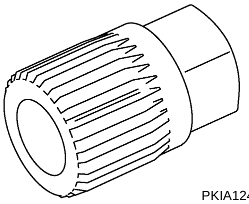
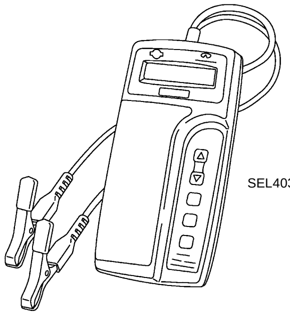
| Tool number<br>(Kent-Moore No.)<br>Tool name | Description |
|---|---|
| KV10118200<br>( — )<br>Alternator pulley adapter<br><br>PKIA1241E | Removing alternator pulley |
| —<br>(J-44373 Model 620)<br>Battery/Starting/Charging system tester<br><br>SEL403X | |

## Commercial Service Tools

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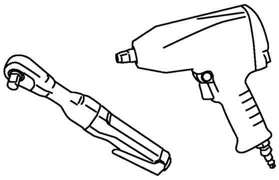
| Tool number<br>Tool name | Description |
|---|---|
| Power tool<br><br>PBIC0190E | Loosening bolts and nuts |

# BATTERY

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## How to Handle Battery

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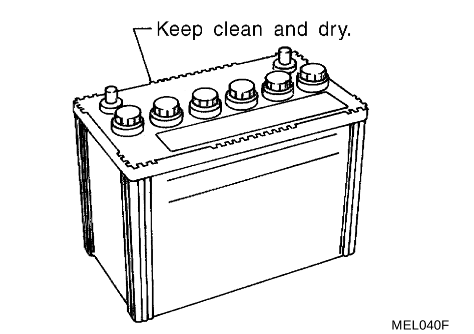
**CAUTION:**

- **If it becomes necessary to start the engine with a booster battery and jumper cables, use a 12-volt booster battery.**
- **After connecting battery cables, ensure that they are tightly clamped to battery terminals for good contact.**

### METHODS OF PREVENTING OVER-DISCHARGE

The following precautions must be taken to prevent over-discharging a battery.

- The battery surface (particularly its top) should always be kept clean and dry.
- The terminal connections should be clean and tight.
- At every routine maintenance, check the electrolyte level.
  This also applies to batteries designated as “low maintenance” and “maintenance-free”.

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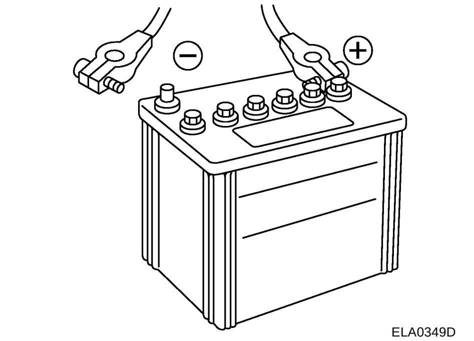
- When the vehicle is not going to be used over a long period of time, disconnect battery cable at negative terminal.



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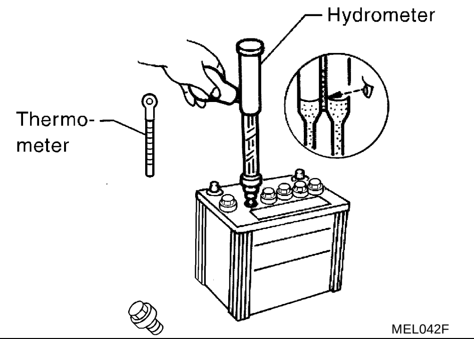
- Check the charge condition of the battery.
  Periodically check the specific gravity of the electrolyte. Keep a close check on charge condition to prevent over-discharge.

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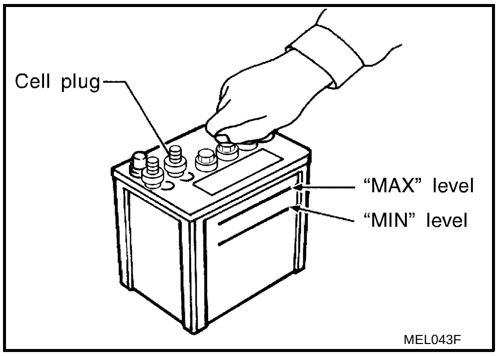
## CHECKING ELECTROLYTE LEVEL

**WARNING:**

**Do not allow battery fluid to come in contact with skin, eyes, fabrics, or painted surfaces. After touching a battery, do not touch or rub your eyes until you have thoroughly washed your hands. If acid contacts eyes, skin or clothing, immediately flush with water for 15 minutes and seek medical attention.**

- Remove the cell plug using a suitable tool.
- Add distilled water up to the MAX level.



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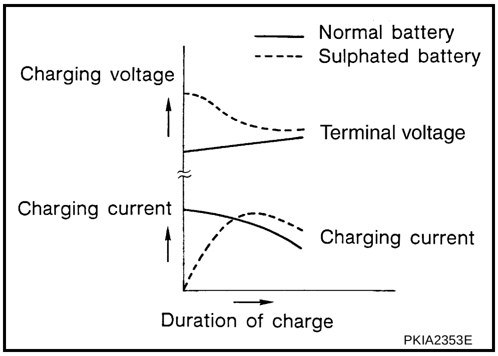
### Sulphation

**A battery will be completely discharged if it is left unattended for a long time and the specific gravity will become less than 1.100. This may result in sulphation on the cell plates.**
**To determine if a battery has been "sulphated", note its voltage and current when charging it. As shown in the figure, less current and higher voltage are observed in the initial stage of charging sulphated batteries.**
**A sulphated battery may sometimes be brought back into service by means of a long, slow charge, 12 hours or more, followed by a battery capacity test.**



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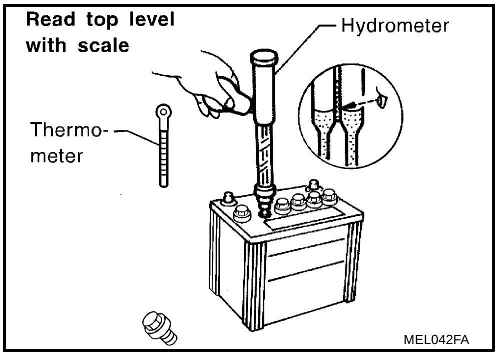
## SPECIFIC GRAVITY CHECK

1. Read hydrometer and thermometer indications at eye level.
2. Use the chart below to correct your hydrometer reading according to electrolyte temperature.



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### Hydrometer Temperature Correction

| Battery electrolyte temperature °C (°F) | Add to specific gravity reading |
|---|---|
| 71 (160) | 0.032 |
| 66 (150) | 0.028 |
| 60 (140) | 0.024 |
| 54 (130) | 0.020 |
| 49 (120) | 0.016 |
| 43 (110) | 0.012 |
| 38 (100) | 0.008 |
| 32 (90) | 0.004 |
| 27 (80) | 0 |
| 21 (70) | –0.004 |

| Battery electrolyte temperature °C (°F) | Add to specific gravity reading |
|---|---|
| 16 (60) | –0.008 |
| 10 (50) | –0.012 |
| 4 (40) | –0.016 |
| –1 (30) | –0.020 |
| –7 (20) | –0.024 |
| –12 (10) | –0.028 |
| –18 (0) | –0.032 |

| Corrected specific gravity | Approximate charge condition |
|---|---|
| 1.260 - 1.280 | Fully charged |
| 1.230 - 1.250 | 3/4 charged |
| 1.200 - 1.220 | 1/2 charged |
| 1.170 - 1.190 | 1/4 charged |
| 1.140 - 1.160 | Almost discharged |
| 1.110 - 1.130 | Completely discharged |

## CHARGING THE BATTERY

**CAUTION:**

- **Do not “quick charge” a fully discharged battery.**
- **Keep the battery away from open flame while it is being charged.**
- **When connecting the charger, connect the leads first, then turn on the charger. Do not turn on the charger first, as this may cause a spark.**
- **If battery electrolyte temperature rises above 55 °C (131 °F), stop charging. Always charge battery at a temperature below 55 °C (131 °F).**

### Charging Rates

| Amps | Time |
|---|---|
| 50 | 1 hour |
| 25 | 2 hours |
| 10 | 5 hours |
| 5 | 10 hours |

**Do not charge at more than 50 ampere rate.**

**NOTE:**

The ammeter reading on your battery charger will automatically decrease as the battery charges. This indicates that the voltage of the battery is increasing normally as the state of charge improves. The charging amps indicated above refer to initial charge rate.

- If, after charging, the specific gravity of any two cells varies more than 0.050, the battery should be replaced.

## Trouble Diagnoses with Battery/Starting/Charging System Tester (Battery) *AKS00BHG*

**CAUTION:**

**When working with batteries, always wear appropriate eye protection.**

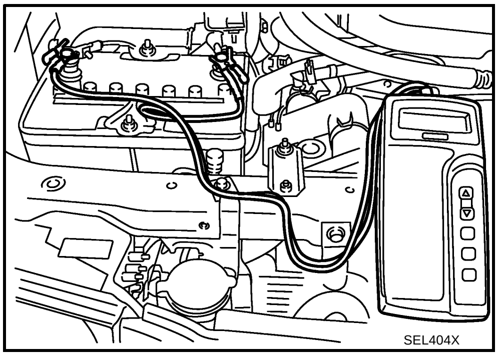
**NOTE:**

- To ensure a complete and thorough diagnosis, the battery, starter and generator test segments must be done as a set from start to finish.
- If battery surface charge is detected while testing, the tester will prompt you to turn on the headlamps to remove the surface charge.
- If necessary, the tester will prompt you to determine if the battery temperature is above or below 0 °C (32 °F). Choose the appropriate selection by pressing the up or down arrow button, then press “ENTER” to make the selection.

1. Turn off all loads on the vehicle electrical system. Clean or repair as necessary.
2. Visually inspect the battery, battery terminals and cable ends with ignition switch in “OFF” position.

   **NOTE:**

   The contact surface between the battery terminals, cable ends and tester leads must be clean for a valid test. A poor connection will prevent testing and a “CHECK CONNECTION” message will appear during the test procedures. If this occurs, clean the battery terminals, reconnect them and restart the test.



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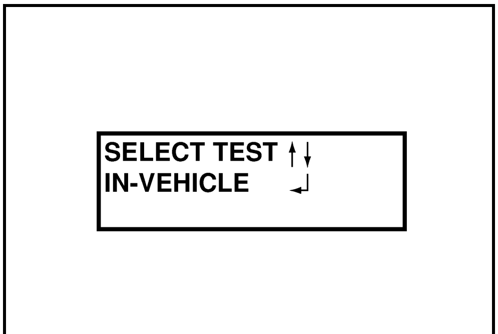
3. Connect the red tester lead clamp to the positive battery terminal, and the black to the negative battery terminal.
4. The tester will turn on automatically. Using the arrow keys, select “IN-VEHICLE” on the tester and then press the “ENTER” key.

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5. Locate the battery **type** and **rating** stamped or written on the top case of the battery to be tested.

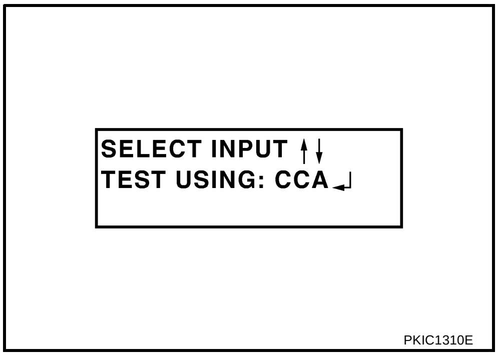
   **NOTE:**

   The battery **rating** will have either of the following.

   - **CCA**: Cold Cranking Amps (490 CCA, 550 CCA, etc.)
   - **JIS**: Japanese Industrial Standard.

   **When using the battery tester: Use the CCA rating only.**

   - The tester requires the CCA rating for the battery be entered exactly as it is written or stamped on the battery.
   - **U.S. market**: Refer to the latest “Battery Testing” Technical Service Bulletin (TSB) for a chart which contains these ratings listed by vehicle.
   - **You must not use the JIS rating.**

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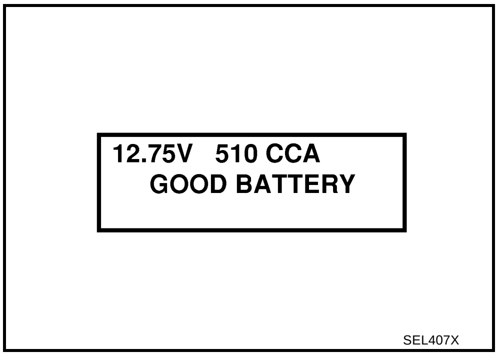
6. Using the arrow and “ENTER” keys alternately, select the battery type and rating.

   **NOTE:**

   The tester lists five choices; CCA, JIS, IEC, DIN, and EN. **Use only the CCA choice** .

7. Press “ENTER” to begin the test. Diagnosis results are displayed on the tester. Refer to SC-8, "DIAGNOSTIC RESULT ITEM CHART" .



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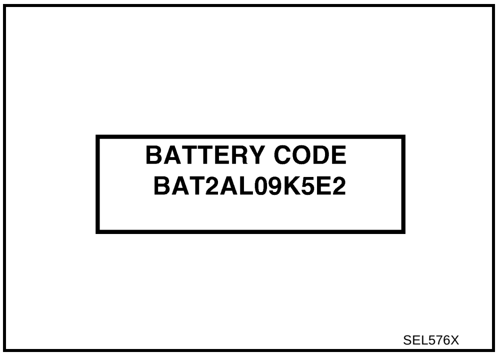
8. Press “ENTER”, then test output code is displayed. Record the test output code on the repair order.
9. Toggle back to the “DIAGNOSTIC SCREEN” for test results.

**NOTE:**
- If necessary, the tester will ask the user to determine if the battery has just been charged. Choose the appropriate selection by pressing the up or down arrow button and then press the “ENTER” button to make the selection.
- When testing a battery installed in a vehicle that has recently been driven, select “BEFORE CHARGE”.
- If the battery has just been slow charged due to a “CHARGE & RETEST” decision by the tester, and the tester asks the user “BEFORE CHARGE/AFTER CHARGE”, select “AFTER CHARGE”.



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### DIAGNOSTIC RESULT ITEM CHART

| Diagnostic item | Service procedure |
|---|---|
| GOOD BATTERY | Battery is OK, go to “Trouble Diagnoses”, “STARTING SYSTEM”. Refer to SC-12, "Trouble Diagnoses with Battery/Starting/Charging System Tester (Starting)" . |
| REPLACE BATTERY | Replace battery.<br>Before replacing battery, clean the battery cable clamps and battery terminals. Perform battery test again with Battery/Starting/Charging system tester. If second test result is “Replace Battery”, then do so. Perform battery test again to confirm repair. |
| BAD CELL-REPLACE | Replace the battery. Perform battery test again with Battery/Starting/Charging system tester to confirm repair. |
| GOOD-RECHARGE | Perform the slow battery charging procedure. (Initial rate of charge is 10 A for 12 hours.) |
| CHARGE & RETEST | Perform the slow battery charging. (Initial rate of charge is 10 A for 12 hours.)<br>Perform battery test again with Battery/Starting/Charging system tester to confirm repair.<br>**NOTE:**<br>**If the tester asks the user “BEFORE CHARGE/AFTER CHARGE”, select “AFTER CHARGE”.** |

## Removal and Installation

*AKS00B6P*

Observe the following to ensure proper servicing.

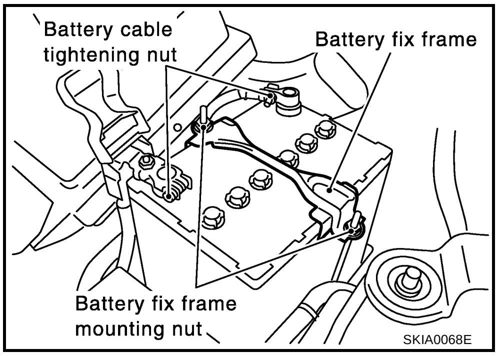
**CAUTION:**
- **When removing, disconnect battery cable at negative terminal first. But for installation, connect battery cable to positive terminal first.**
- **Tighten parts to the specified torque shown below.**

**Battery fix frame mounting nut:**

**: 4.4 N·m (0.45 kg-m, 39 in-lb)**

**Battery cable tightening nut:**

**: 4.0 N·m (0.41 kg-m, 35 in-lb)**



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# STARTING SYSTEM

PFP:00011

## System Description

AKS00B6Z

### M/T MODELS

Power is supplied at all times

- through 30A fusible link (letter J, located in the fuse and fusible link box)
- to ignition switch terminal 1.

With the ignition switch in the START position, power is supplied

- from ignition switch terminal 5
- to park/neutral position relay terminal 5.

With the ignition switch in the ON or START position, power is supplied

- through 10A fuse [No,13 located in the fuse block (J/B)]
- to park/neutral position relay terminal 1.

With the clutch interlock switch is depressed, ground is supplied

- to park/neutral position relay terminal 2
- through clutch interlock switch terminals 1 and 2, and
- through grounds M27 and M70.

Then park/neutral position relay is energized and power is supplied

- from park/neutral position relay terminal 3
- to starter motor harness connector terminal 1.

The starter motor plunger closes and provides a closed circuit between the battery and starter motor. The starter motor is grounded to engine block. With power and ground supplied, cranking occurs and the engine starts.

### A/T MODELS

Power is supplied at all times

- through 30A fusible link (letter J, located in fuse and fusible link box)
- to ignition switch terminal 1.

With the ignition switch in the START position, power is supplied

- from ignition switch terminal 5
- to park/neutral position relay terminal 5.

With the ignition switch in the ON or START position, power is supplied

- through 10A fuse [No,13 located in the fuse block (J/B)]
- to park/neutral position relay terminal 1.

With the selector lever in the P or N position, ground is supplied

- to park/neutral position relay terminal 2
- through park/neutral position switch terminals 1 and 2, and
- through grounds F9 and F10.

Then park/neutral position relay is energized and power is supplied

- from park/neutral position relay terminal 3
- to starter motor harness connector terminal 1.

The starter motor plunger closes and provides a closed circuit between the battery and starter motor. The starter motor is grounded to engine block. With power and ground supplied, cranking occurs and the engine starts.

## Wiring Diagram — START —

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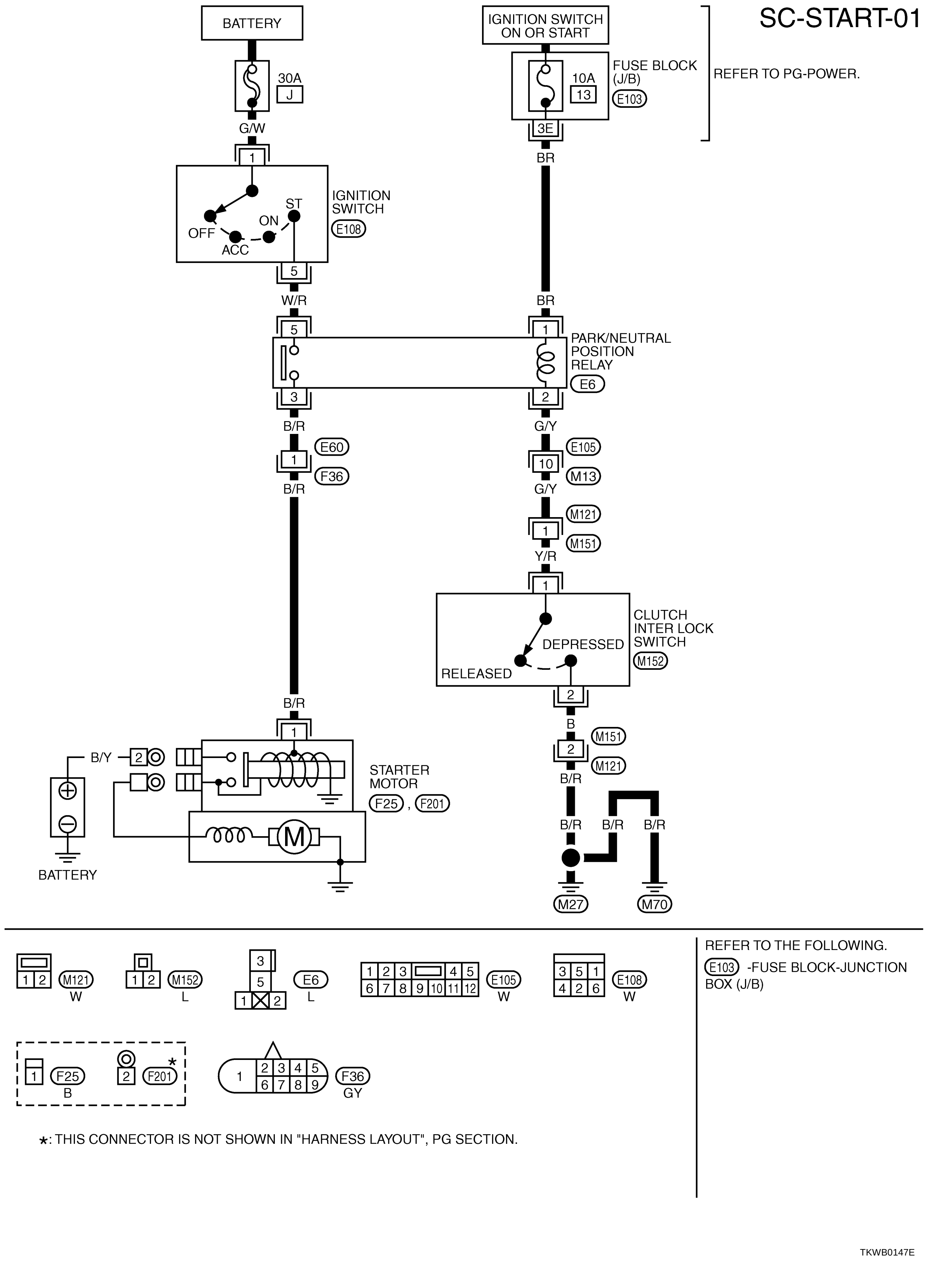
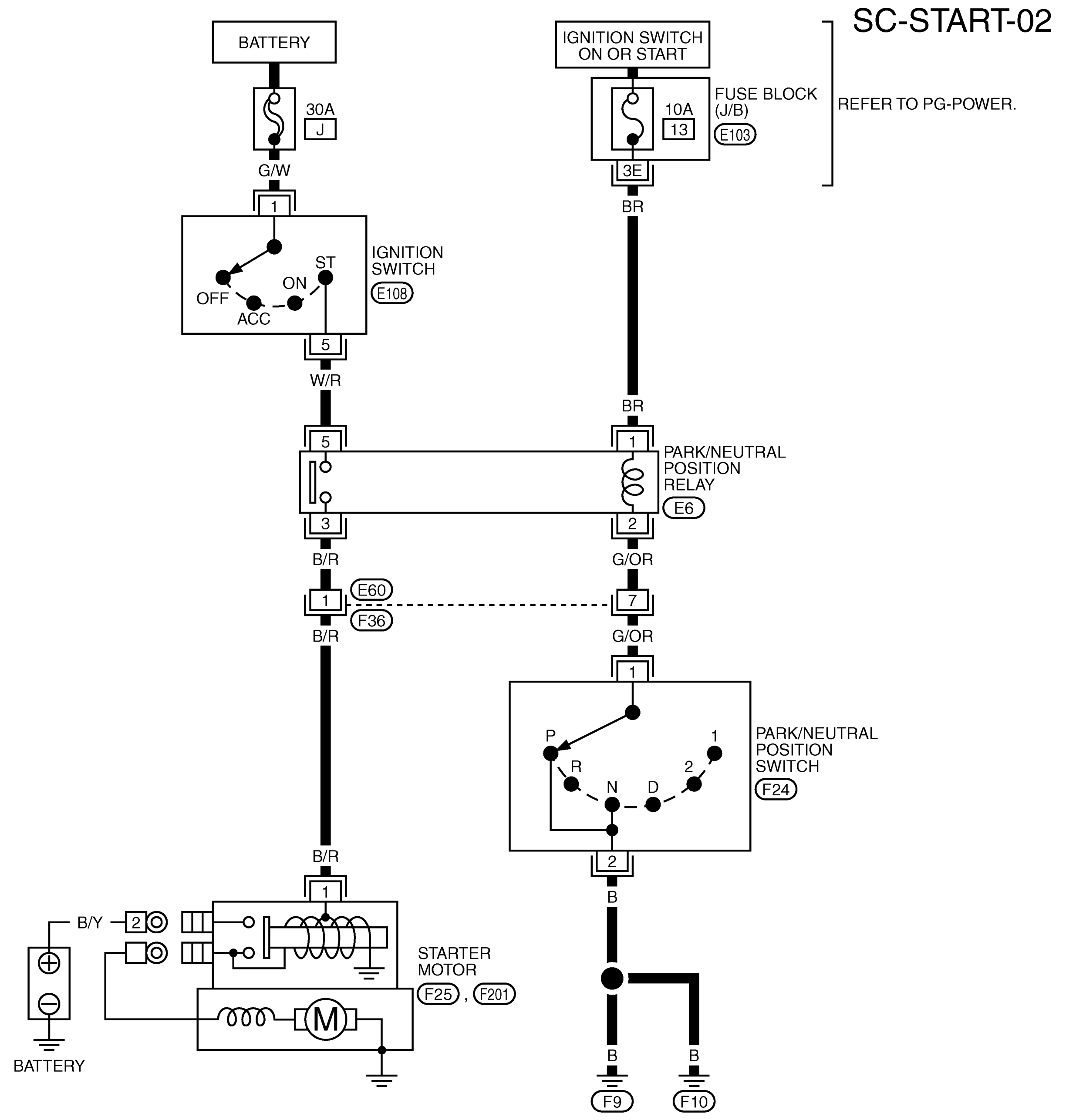
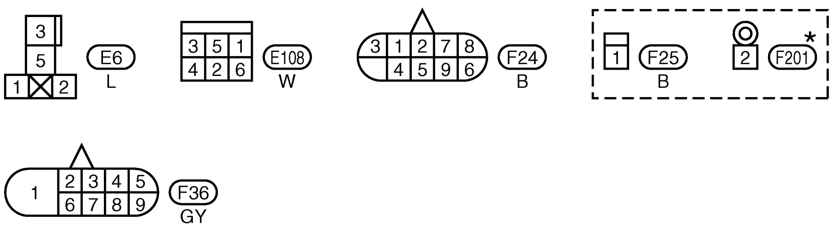
### M/T MODELS



## A/T MODELS




REFER TO THE FOLLOWING.

E103 -FUSE BLOCK-JUNCTION BOX (J/B)

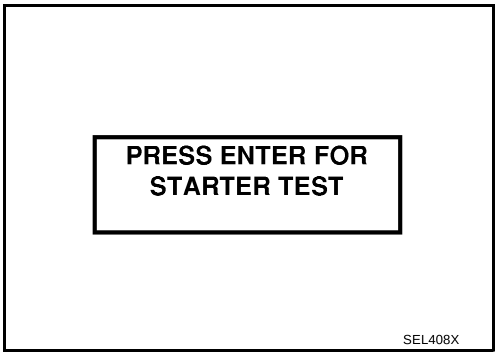
*: THIS CONNECTOR IS NOT SHOWN IN "HARNESS LAYOUT", PG SECTION.

TKWB0148E

## Trouble Diagnoses with Battery/Starting/Charging System Tester (Starting) *AKS00BHH*

**NOTE:**
To ensure a complete and thorough diagnosis, battery, starter and generator test segments must be done as a set from start to finish.

1. Turn off all loads on the vehicle electrical system.
2. Perform battery test with Battery/Starting/Charging system tester. Refer to SC-7, "Trouble Diagnoses with Battery/Starting/Charging System Tester (Battery)" .
3. Press “ENTER” to begin the starting system test.



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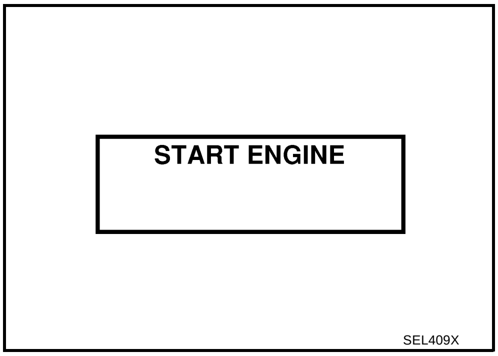
4. Start the engine.



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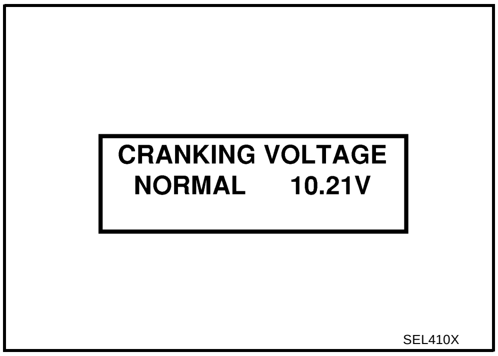
5. Diagnosis result is displayed on the tester. Refer to SC-12, "DIAGNOSTIC RESULT ITEM CHART" .

   **NOTE:**
   - If starter performs normally but the engine does not start, perform engine diagnosis.
   - For intermittent “NO CRANK” or “NO STARTER OPERATION” incidents, refer to SC-15, "DIAGNOSTIC PROCEDURE 2" .



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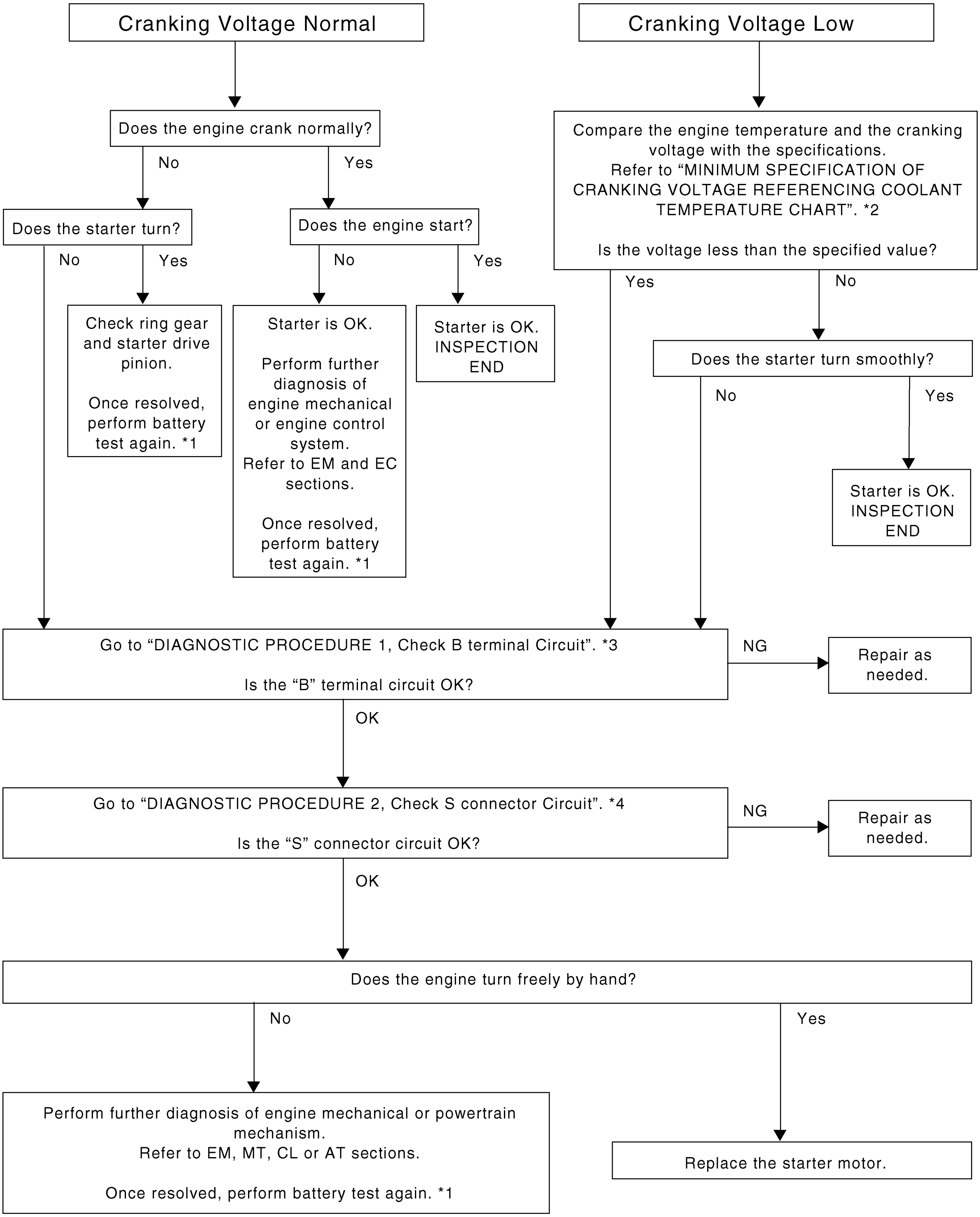
### DIAGNOSTIC RESULT ITEM CHART

| Diagnostic item | Service procedure |
|---|---|
| CRANKING VOLTAGE NORMAL | Go to SC-13, "WORK FLOW" . |
| CRANKING VOLTAGE LOW | |
| CHARGE BATTERY | Perform the slow battery charging procedure. (Initial rate of charge is 10 A for 12 hours.) Perform battery test again with Battery/Starting/Charging system tester. Refer to SC-7, "Trouble Diagnoses with Battery/Starting/Charging System Tester (Battery)" . |
| REPLACE BATTERY | Before replacing battery, clean the battery cable clamps and battery posts. Perform battery test again with Battery/Starting/Charging system tester. Refer to SC-7, "Trouble Diagnoses with Battery/Starting/Charging System Tester (Battery)" . If second test result is “REPLACE BATTERY”, then do so. Perform battery test again to confirm repair. |

## WORK FLOW

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*1 SC-12, "Trouble Diagnoses with Battery/Starting/Charging System Tester (Starting)"

*2 SC-15, "MINIMUM SPECIFICATION OF CRANKING VOLTAGE REFERENCING COOLANT TEMPERATURE"

*3 SC-14, "Check “B” Terminal Circuit"

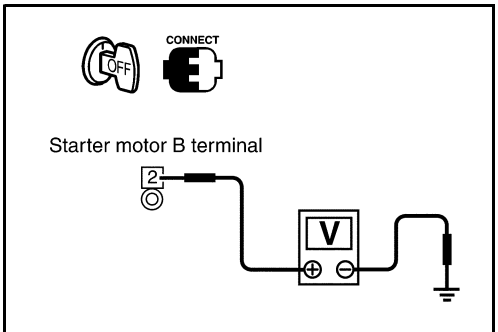
*4 SC-15, "Check “S” Connector Circuit"

## DIAGNOSTIC PROCEDURE 1

### Check “B” Terminal Circuit

### 1. CHECK POWER SUPPLY FOR STARTER MOTOR “B” TERMINAL

1. Remove fuel pump fuse.
2. Crank or start the engine (where possible) until the fuel pressure is released.
3. Turn ignition switch OFF.
4. Make sure that starter motor B terminal F201 terminal 2 (B/Y) connection is clean and tight.
5. Check voltage between starter motor B terminal F201 terminal 2 (B/Y) and ground using a digital circuit tester.



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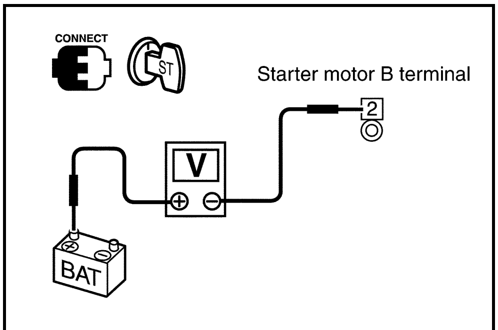
**2 (B/Y) – Ground : Battery voltage**

OK or NG

OK >> GO TO 2.
NG >> Check harness between battery and starter motor for open circuit.

### 2. CHECK BATTERY CABLE CONNECTION (VOLTAGE DROP TEST)

1. Shift A/T selector lever to “P” or “N” position. (A/T models)
   Keep depressing clutch pedal fully. (M/T models)
2. Check voltage between starter motor B terminal F201 terminal 2 (B/Y) and battery positive terminal using a digital circuit tester.



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**2 (B/Y) – Battery positive terminal**

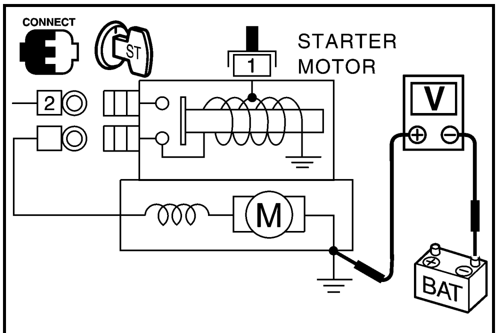
**When ignition switch is in START position : Less than 0.5 V**

OK or NG

OK >> GO TO 3.
NG >> Check harness between battery and starter motor for poor continuity.

### 3. CHECK STARTER MOTOR GROUND CIRCUIT (VOLTAGE DROP TEST)

1. Shift A/T selector lever to “P” or “N” position. (A/T models)
   Keep depressing clutch pedal fully. (M/T models)
2. Check voltage between starter motor case and battery negative terminal using a digital circuit tester.



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**Starter motor case – Battery negative terminal**

**When ignition switch is in START position : Less than 0.2 V**

OK or NG

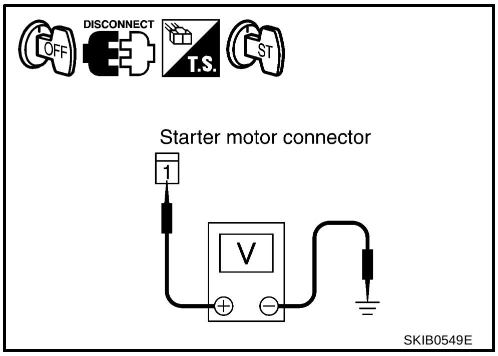
OK >> Starter motor “B” terminal circuit is OK. Further inspection necessary. Refer to SC-13, "WORK FLOW" .
NG >> Check starter motor case and ground for poor continuity.

## DIAGNOSTIC PROCEDURE 2

### Check “S” Connector Circuit

### 1. CHECK POWER SUPPLY FOR STARTER MOTOR “S” TERMINAL

1. Remove fuel pump fuse.
2. Crank or start the engine (where possible) until the fuel pressure is released.
3. Turn ignition switch OFF.
4. Disconnect starter motor “S” connector.
5. Shift A/T selector lever to “P” or “N” position. (A/T models)
   Keep depressing clutch pedal fully. (M/T models)
6. Check voltage between starter motor harness connector F25 terminal 1 (B/R) and ground using a digital circuit tester.




**1 (B/R) – Ground**

**When ignition switch is in START position : Battery voltage**

OK or NG

OK >> Starter motor “S” connector circuit is OK. Further inspection necessary. Refer to SC-13, "WORK FLOW" .

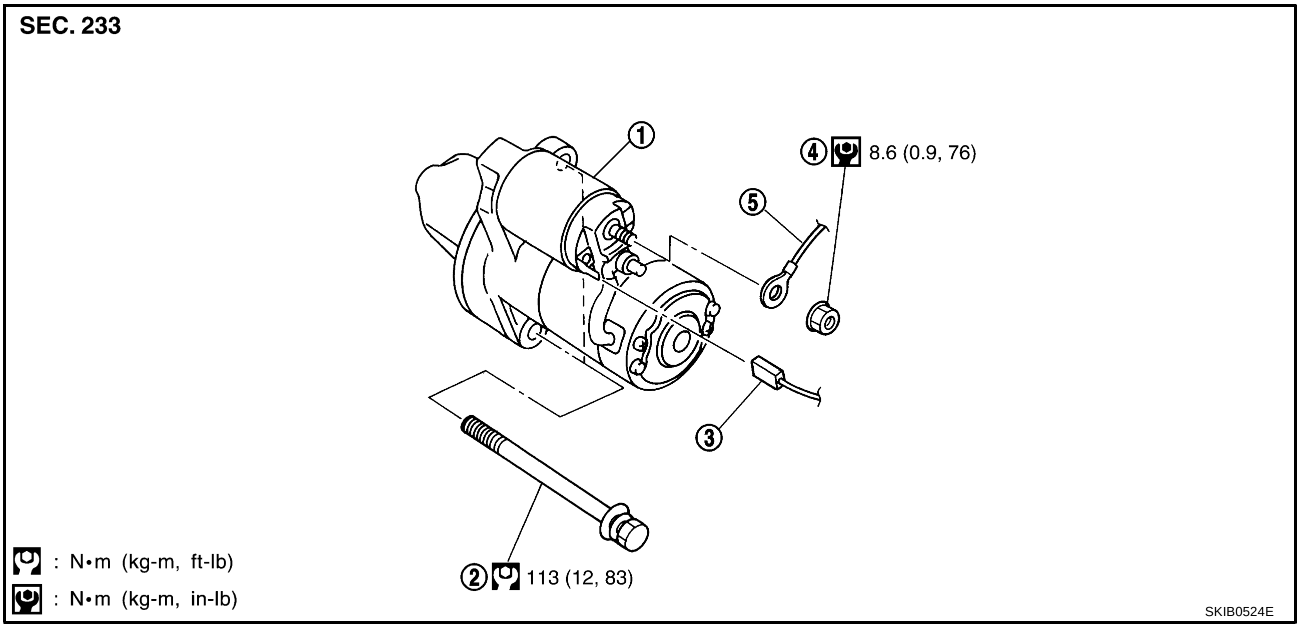
NG >> Check the following.
- 30 A fusible link (letter J , located in fuse and fusible link block)
- Ignition switch
- Park/neutral position relay
- Harness for open or short

## MINIMUM SPECIFICATION OF CRANKING VOLTAGE REFERENCING COOLANT TEMPERATURE

| Engine coolant temperature | Voltage [V] |
|---|---|
| –30 °C to –20 °C (–22 °F to –4 °F) | 8.4 |
| –19 °C to –10 °C (–2 °F to 14 °F) | 8.9 |
| –9 °C to 0 °C (16 °F to 32 °F) | 9.3 |
| 1 °C and higher (34 °F and higher) | 9.7 |

# Removal and Installation
AKS00B73

## M/T MODELS




| | | | | | |
|---|---|---|---|---|---|
| 1. | Starter motor assembly | 2. | Starter motor mounting bolt | 3. | S connector |
| 4. | B terminal nut | 5. | B terminal | | |

### Removal

1. Disconnect battery cable at negative terminal.
2. Remove air duct. Refer to EM-14, "AIR CLEANER AND AIR DUCT" .
3. Disconnect “S” connector and “B” terminal from starter motor.
4. Remove starter motor mounting bolts.
5. Remove starter motor upward.

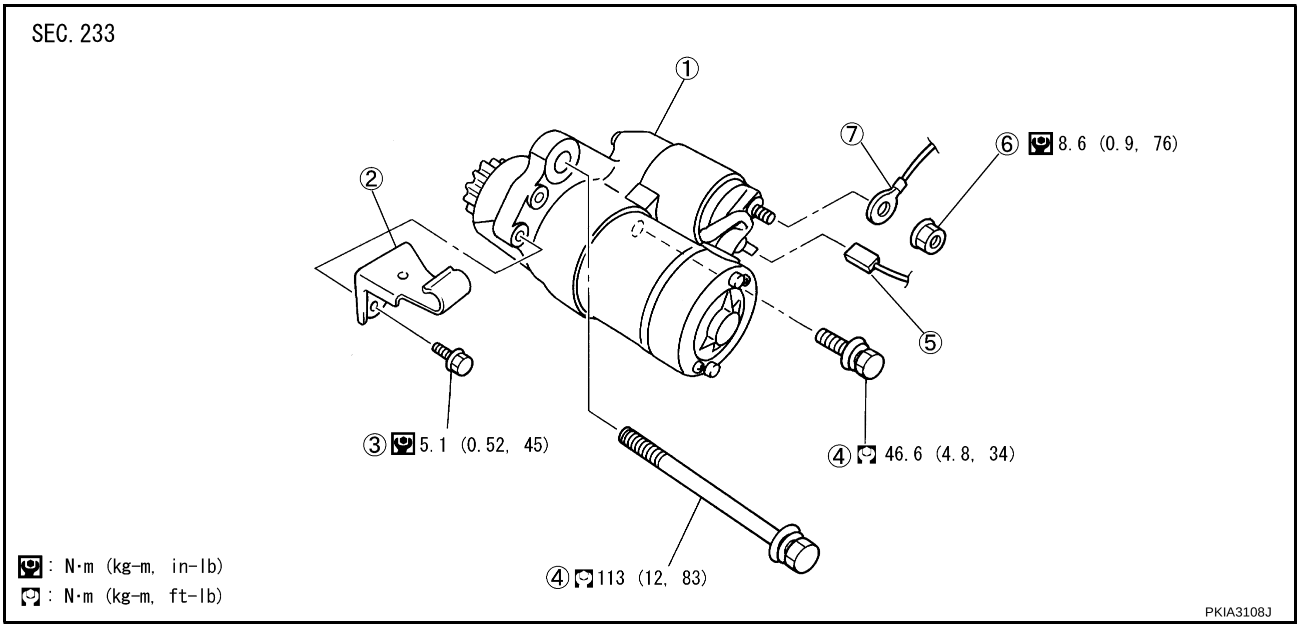
### Installation

Installation is the reverse order of removal.

**CAUTION:**

**Be sure to tighten B terminal nut carefully.**

## A/T MODELS




| | | | | | |
|---|---|---|---|---|---|
| 1. | Starter motor assembly | 2. | Bracket | 3. | Bracket bolt |
| 4. | Starter motor mounting bolt | 5. | S connector | 6. | B terminal nut |
| 7. | B terminal | | | | |

### Removal

1. Disconnect battery cable at negative terminal.
2. Remove air duct and air cleaner assembly. Refer to EM-14, "AIR CLEANER AND AIR DUCT" .
3. Remove A/T selector cable and harness from bracket.
4. Disconnect “S” connector and “B” terminal from starter motor.
5. Remove starter motor upward.

### Installation

Installation is the reverse order of removal.

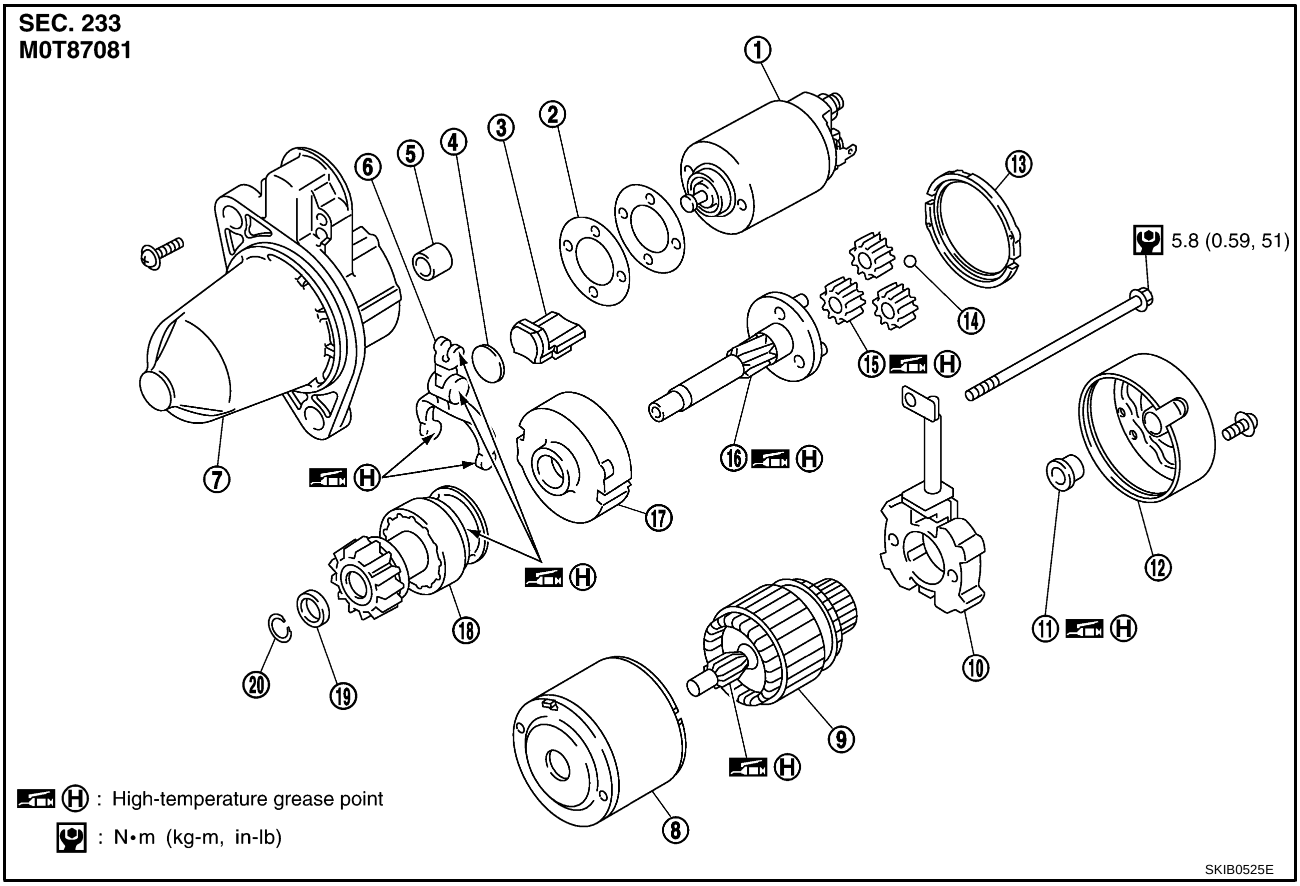
**CAUTION:**

**Be sure to tighten B terminal nut carefully.**

## Disassembly and Assembly

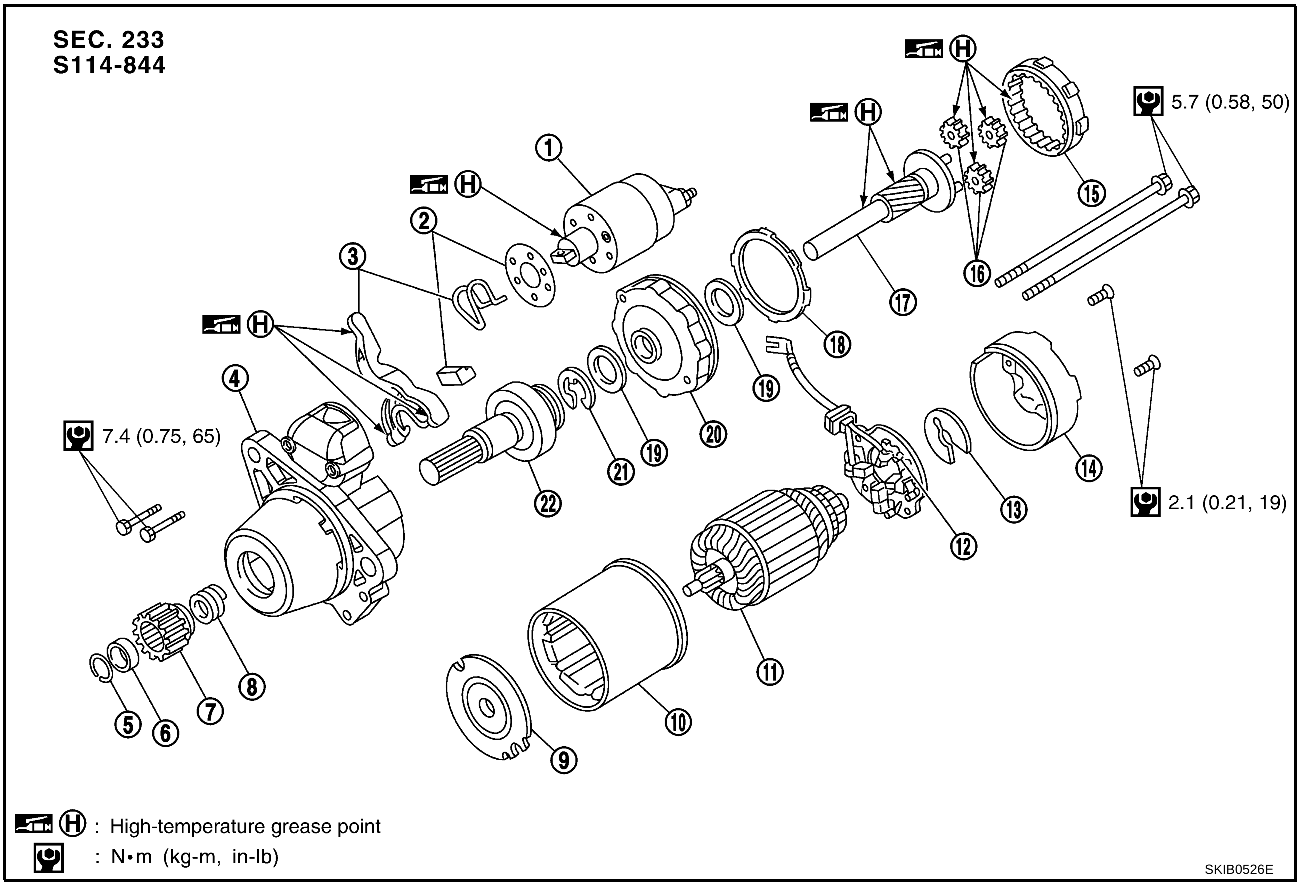
AKS00C3E

### M/T MODELS




| | | | | | |
|---|---|---|---|---|---|
| 1. | Magnetic switch assembly | 2. | Adjusting plate | 3. | Packing |
| 4. | Plate | 5. | Sleeve bearing | 6. | Shift lever |
| 7. | Gear case | 8. | Yoke | 9. | Armature |
| 10. | Brush holder assembly | 11. | Rear bearing | 12. | Rear cover |
| 13. | Packing | 14. | Ball | 15. | Planetary gear |
| 16. | Pinion shaft | 17. | Internal gear | 18. | Pinion assembly |
| 19. | Pinion stopper | 20. | Stopper clip | | |

## A/T MODELS




| | | |
|---|---|---|
| 1. Magnetic switch assembly | 2. Dust cover kit | 3. Shift lever set |
| 4. Gear case | 5. Pinion stopper clip | 6. Pinion stopper |
| 7. Pinion | 8. Pinion spring | 9. Center bracket (A) |
| 10. Yoke | 11. Armature | 12. Brush holder assembly |
| 13. Thrust washer | 14. Rear cover | 15. Internal gear |
| 16. Planetary gear | 17. Pinion shaft | 18. Packing |
| 19. Thrust washer | 20. Center bracket (P) | 21. E-ring |
| 22. Clutch assembly | | |

## INSPECTION AFTER DISASSEMBLY

### Pinion/Clutch Check

1. Inspect pinion teeth.
   - Replace pinion if teeth are worn or damaged. (Also check condition of ring gear teeth.)
2. Inspect reduction gear teeth.
   - Replace reduction gear if teeth are worn or damaged. (Also check condition of armature shaft gear teeth.)
3. Check to see if pinion locks in one direction and rotates smoothly in the opposite direction.
   - If it locks or rotates in both directions, or unusual resistance is evident, replace.

# CHARGING SYSTEM

PFP:00011

## System Description

AKS00B6Q

### DESCRIPTION

The alternator provides DC voltage to operate the vehicle's electrical system and to keep the battery charged. The voltage output is controlled by the IC regulator.
Power is supplied at all times

- through 10A fuse (No. 34, located in the fuse and fusible link box)
- to alternator terminal 4 (“S” terminal).

“B” terminal supplies power to charge the battery and operate the vehicle's electrical system. Output voltage is controlled by the IC regulator at terminal 4 (“S” terminal) detecting the input voltage. The charging circuit is protected by the 120A fusible link (letter A, located in the fuse and fusible link box).
The alternator is grounded to the engine block.
With the ignition switch in the ON or START position, power is supplied

- through 10A fuse [No. 11, located in the fuse block (J/B)]
- to combination meter terminal 2 for the charge warning lamp.

Ground is supplied with power and ground supplied

- to terminal 5 of combination meter
- through alternator terminal 3 (“L” terminal)
- to alternator terminal 2 (“E” terminal)
- through ground E30.

The charge warning lamp will illuminate. When the alternator is providing sufficient voltage with the engine running, the ground is opened and the charge warning lamp will go off.
If the charge warning lamp illuminates with the engine running, a malfunction is indicated.

### CHARGE WARNING LAMP

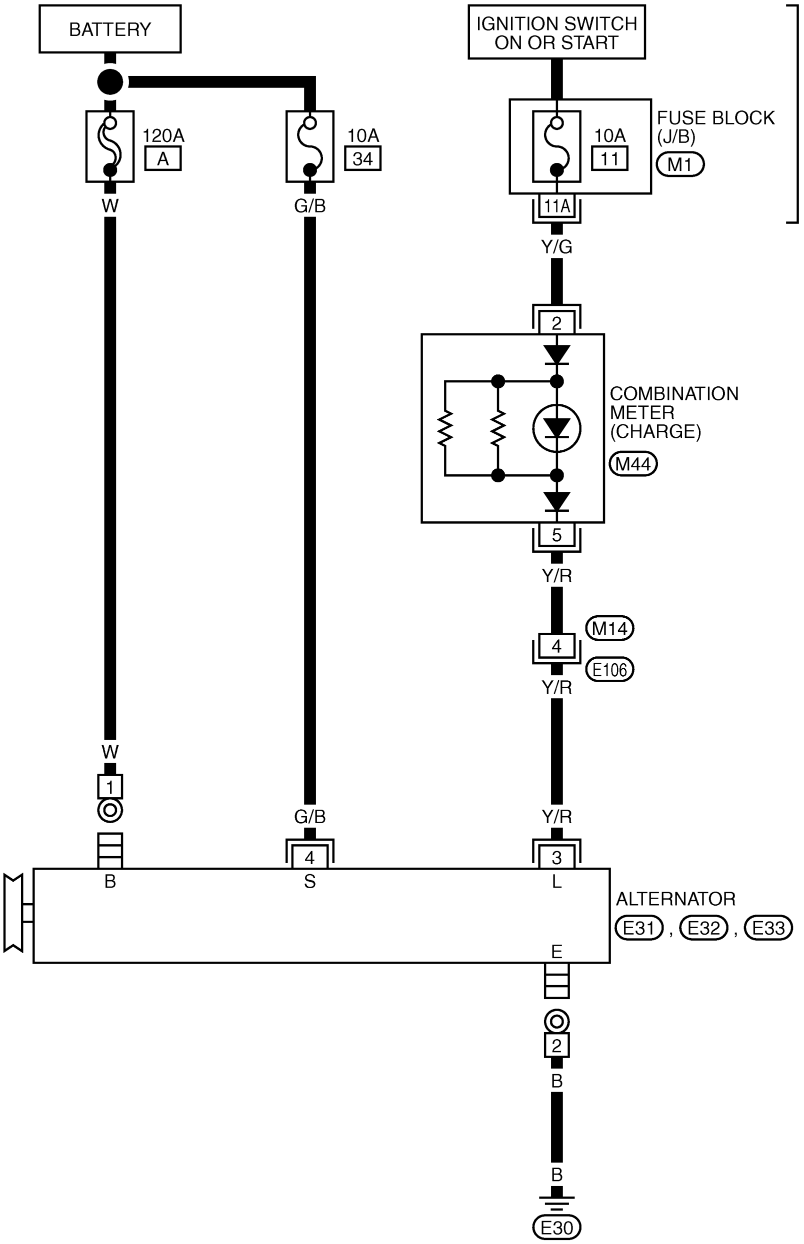
The IC regulator warning function activates to illuminate the charge warning lamp, if any of the following symptoms occur while alternator is operating:

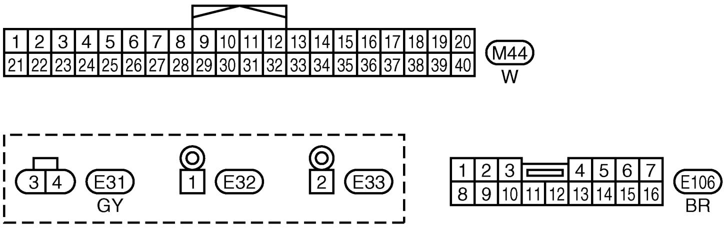
- Excessive voltage is produced.
- No voltage is produced.

## Wiring Diagram — CHARGE —

AKS00B6R

SC-CHARGE-01




REFER TO THE FOLLOWING.

M1 -FUSE BLOCK-JUNCTION BOX (J/B)

TKWB0149E

## Trouble Diagnoses with Battery/Starting/Charging System Tester (Charging)

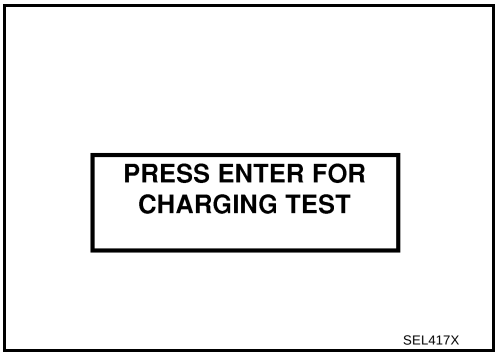
*AKS00BHJ*

**NOTE:**

To ensure a complete and thorough diagnosis, battery, starter and alternator test segments must be done as a set from start to finish.

**Before starting, perform the preliminary inspection. Refer to** **SC-25, "PRELIMINARY INSPECTION"** **.**

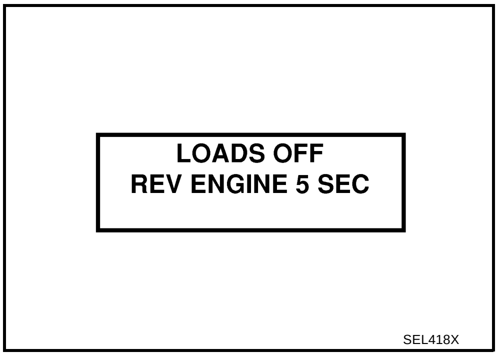
1. Turn off all loads on the vehicle electrical system.
2. Perform battery and starting system test with Battery/Starting/Charging system tester.
3. Press “ENTER” to begin charging system test.
4. Start engine.



SEL417X

5. Press “ENTER” until “LOADS OFF REV ENGINE 5 SEC” is displayed.
6. Raise and hold the engine speed at 1,500 to 2,000 rpm for about 5 seconds, then return the engine to idle.
   Once the increase in engine rpm is detected, press “ENTER” to continue.

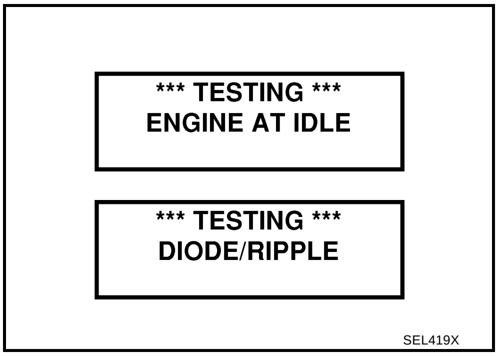
   **NOTE:**
   - If after 30 seconds an increase in engine idle speed is not detected, “RPM NOT DETECTED” will display.
   - Some engines may have a higher idle initially after starting, particularly when the engine is cold. The tester may detect this without any other action being taken. If this occurs, continue on with the testing process. The final results will not be affected.



SEL418X

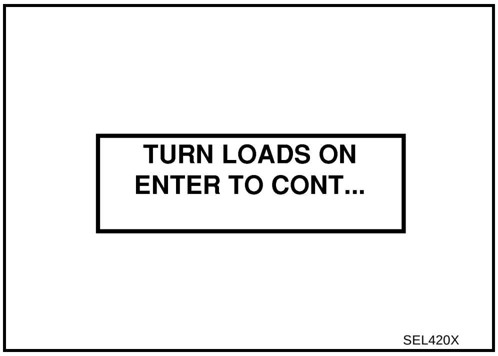
7. The tester now checks the engine at idle and performs the DIODE/RIPPLE check.
8. When complete, the tester will prompt you to turn on the following electrical loads.
   - Heater fan set to highest speed. Do not run the A/C or windshield defroster.
   - Headlamp high beam
   - Rear window defogger

   **NOTE:**
   Do not run the windshield wipers or any other cyclical loads.



SEL419X

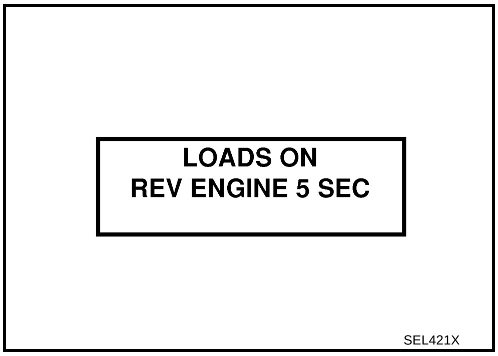
9. Press “ENTER” to continue.



SEL420X

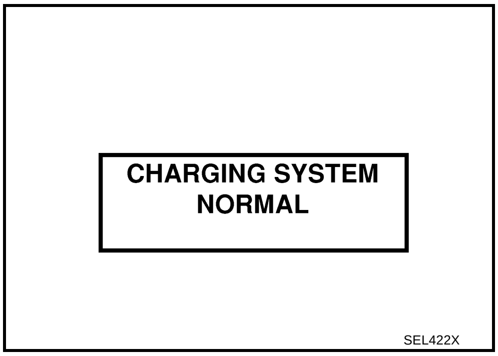
10. Raise and hold the engine speed at 1,500 to 2,000 rpm for about 5 seconds, then return the engine to idle. Once the increase in engine rpm is detected, press “ENTER” to continue.

    **NOTE:**
    If after 30 seconds an increase in engine idle speed is not detected, “RPM NOT DETECTED” will be displayed. Press “ENTER” to restart the test.



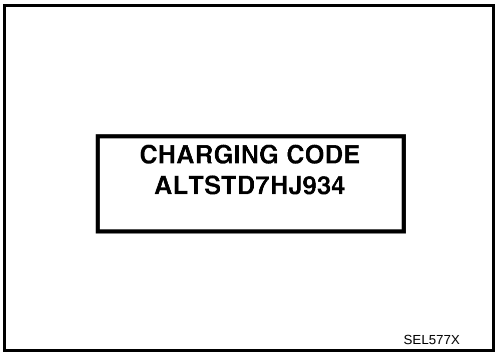
SEL421X

11. Diagnostic result is displayed on the tester. Refer to SC-23, "DIAGNOSTIC RESULT ITEM CHART" .



SEL422X

12. Press “ENTER” then test output code is displayed. Record the test output code on the repair order.
13. Toggle back to the “DIAGNOSTIC SCREEN” for test results.

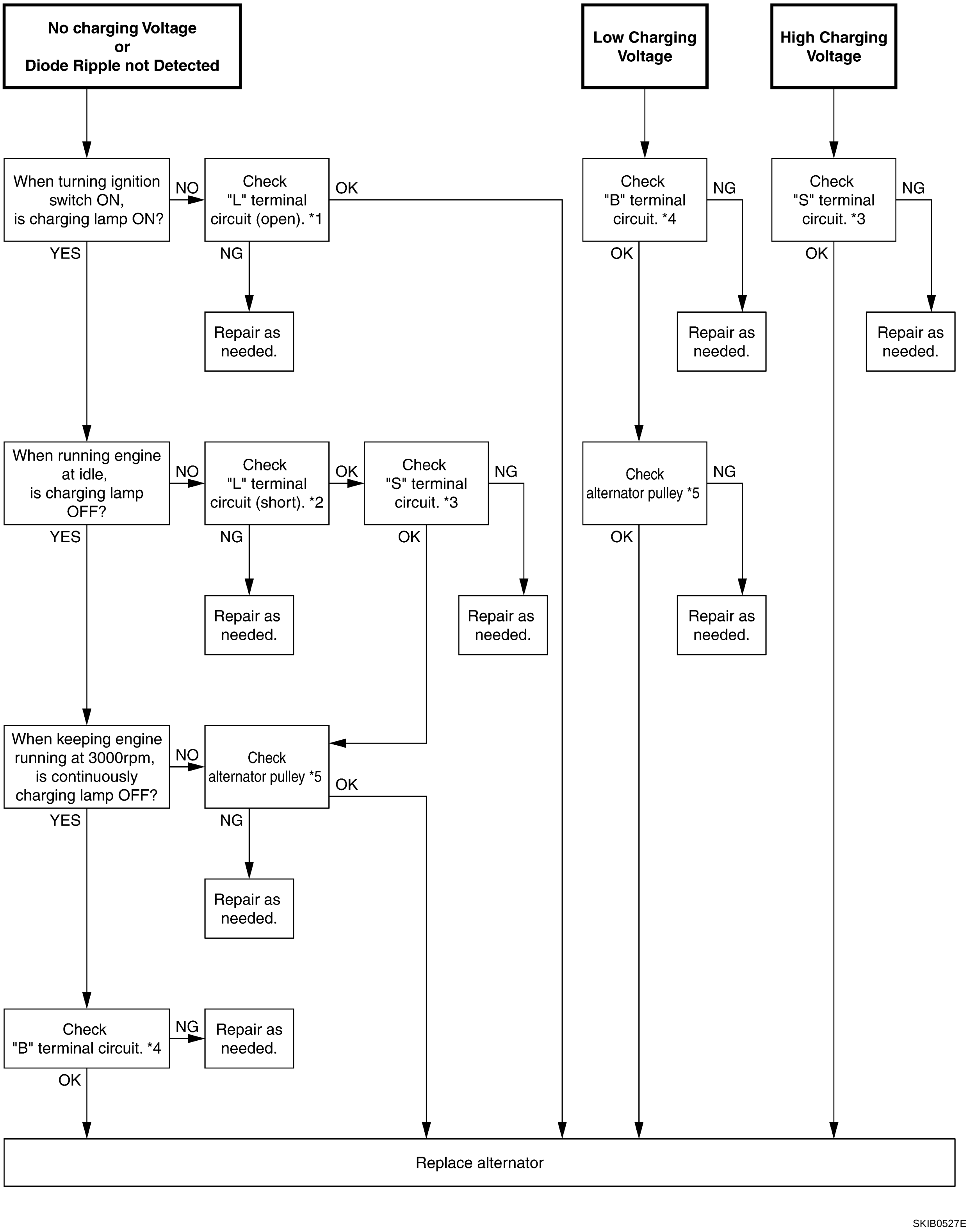


SEL577X

## DIAGNOSTIC RESULT ITEM CHART

| Diagnostic item | Service procedure |
|---|---|
| CHARGING SYSTEM NORMAL | Charging system is normal and will also show DIODE RIPPLE test result. |
| NO CHARGING VOLTAGE | Go to SC-24, "WORK FLOW" . |
| LOW CHARGING VOLTAGE | |
| HIGH CHARGING VOLTAGE | |
| DIODE RIPPLE NORMAL | Diode ripple is OK and will also show CHARGING VOLTAGE test result. |
| EXCESS RIPPLE DETECTED | Replace alternator. Perform “DIODE RIPPLE” test again using Battery/Starting/Charging system tester to confirm repair. |
| DIODE RIPPLE NOT DETECTED | Go to SC-24, "WORK FLOW" . |

## WORK FLOW




*1 SC-26, "Check “L” Terminal Circuit (Open)"

*2 SC-26, "Check “L” Terminal Circuit (Short)"

*3 SC-27, "Check “S” Terminal Circuit"

*4 SC-28, "Check “B” Terminal Circuit"

*5 SC-29, "ALTERNATOR PULLEY INSPECTION"

## PRELIMINARY INSPECTION

### 1. CHECK BATTERY TERMINALS CONNECTION

Check if battery terminals is clean and tight.

OK or NG

OK >> GO TO 2.
NG >> Repair battery terminals connection.

### 2. CHECK FUSE AND FUSIBLE LINK

Check for blown fuse and fusible link. Refer to PG-52, "FUSE AND FUSIBLE LINK BOX" .

| Unit | Power source (Power supply terminals) | Fuse and fusible link No. |
|---|---|---|
| Alternator | Battery (“B” terminal) | A |
| | Battery (“S” terminal) | 34 |
| Combination meter | Ignition switch ON (“L” terminal) | 11 |

OK or NG

OK >> GO TO 3.
NG >> If fuse is blown, be sure eliminate cause of malfunction before installing new fuse.

### 3. CHECK “E” TERMINAL CONNECTION

Check if “E” terminal is clean and tight.

OK or NG

OK >> GO TO 4.
NG >> Repair “E” terminal connection.

### 4. CHECK ALTERNATOR DRIVE BELT TENSION

Check alternator drive belt tension. Refer to EM-11, "Checking Drive Belt" .

OK or NG

OK >> INSPECTION END
NG >> Repair as needed.

## DIAGNOSTIC PROCEDURE 1

### Check “L” Terminal Circuit (Open)

### 1. CHECK “L” TERMINAL CONNECTION

1. Turn ignition switch OFF.
2. Check if “L” terminal is clean and tight.

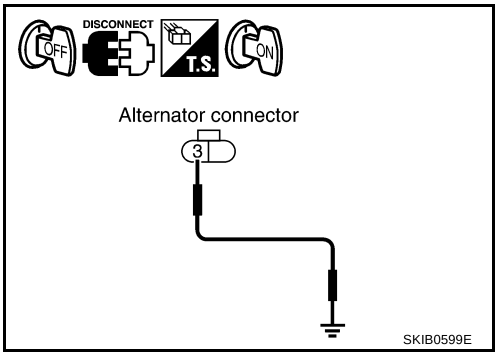
OK or NG

OK >> GO TO 2.
NG >> Repair “L” terminal connection. Confirm repair by performing complete Battery/Starting/Charging system test.

### 2. CHECK “L” TERMINAL CIRCUIT (OPEN)

1. Disconnect alternator connector.
2. Apply ground to alternator harness connector E31 terminal 3 (Y/R) with ignition switch in the ON position.

**3 (Y/R) – Ground : Charge warning lamp should light up.**




OK or NG

OK >> Go to SC-24, "WORK FLOW" .
NG >> Check the following.

- Harness for open between combination meter and alternator
- Harness for open between combination meter and fuse
- Charge warning lamp (Combination meter)

## DIAGNOSTIC PROCEDURE 2

### Check “L” Terminal Circuit (Short)

### 1. CHECK “L” TERMINAL CIRCUIT (SHORT)

1. Turn ignition switch OFF.
2. Disconnect alternator connector.
3. Turn ignition switch ON.

Charge warning lamp should light up?

YES >> Check the following.

- Harness for short between combination meter and alternator
- Charge warning lamp (Combination meter)

NO >> Go to SC-24, "WORK FLOW" .

## DIAGNOSTIC PROCEDURE 3

### Check “S” Terminal Circuit

### 1. CHECK “S” TERMINAL CONNECTION

1. Turn ignition switch OFF.
2. Check if “S” terminal is clean and tight.

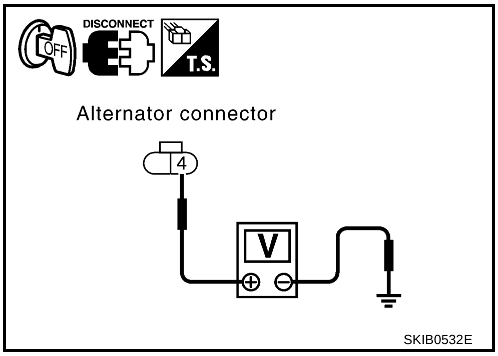
OK or NG

OK >> GO TO 2.
NG >> Repair “S” terminal connection. Confirm repair by performing complete Battery/Starting/Charging system test.

### 2. CHECK ALTERNATOR “S” TERMINAL CIRCUIT

Check voltage between alternator harness connector E31 terminal 4 (G/B) and ground using a digital circuit tester.

**4 (G/B) – Ground : Battery voltage**




OK or NG

OK >> Go to SC-24, "WORK FLOW" .
NG >> Harness for open between alternator and fuse.

A B C D E F G H I J SC L M

## DIAGNOSTIC PROCEDURE 4

### Check “B” Terminal Circuit

### 1. CHECK “B” TERMINAL CONNECTION

1. Turn ignition switch OFF.
2. Check if “B” terminal is clean and tight.

OK or NG

OK >> GO TO 2.
NG >> Repair “B” terminal connection. Confirm repair by performing complete Battery/Starting/Charging system test.

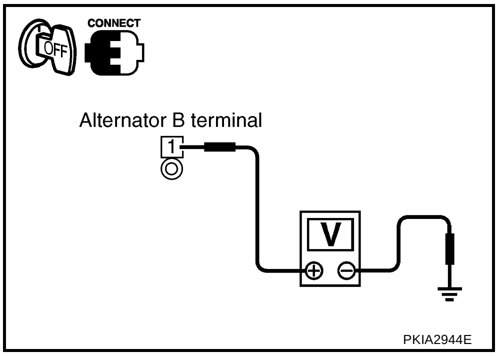
### 2. CHECK ALTERNATOR “B” TERMINAL CIRCUIT

Check voltage between alternator “B” terminal E32 terminal 1 (W) and ground using a digital circuit tester.

**1 (W) – Ground : Battery voltage**

OK or NG

OK >> GO TO 3.
NG >> Check harness for open between alternator and fusible link.



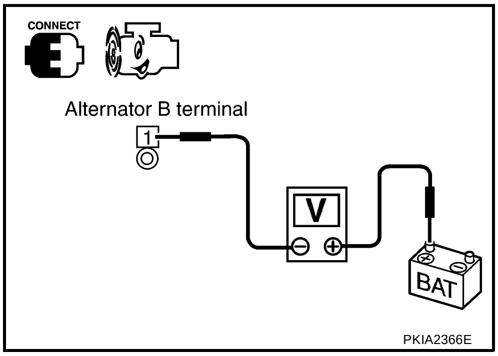

### 3. CHECK “B” TERMINAL CONNECTION (VOLTAGE DROP TEST)

1. Start engine.
2. When engine running at idle and warm, check voltage between alternator “B” terminal E32 terminal 1 (W) and battery positive terminal using a digital circuit tester.

**1 (W) – Battery positive terminal : Less than 0.2 V**

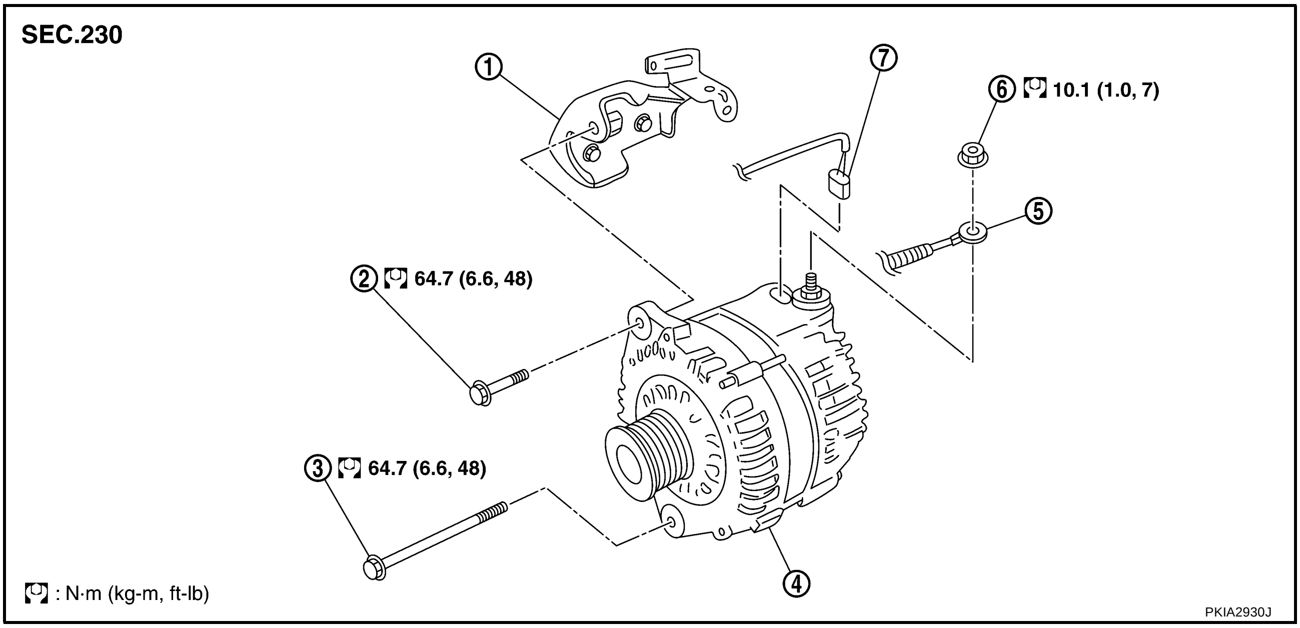
OK or NG

OK >> Go to SC-24, "WORK FLOW" .
NG >> Check harness between battery and alternator for poor continuity.



## Removal and Installation

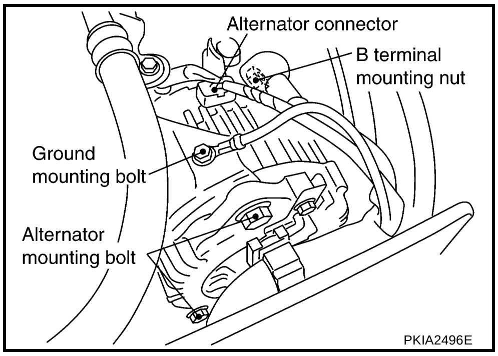
AKS00C3D




| | | | | | |
|---|---|---|---|---|---|
| 1. | Alternator bracket | 2. | Alternator mounting bolt | 3. | Alternator mounting bolt |
| 4. | Alternator assembly | 5. | B terminal | 6. | B terminal mounting nut |
| 7. | Alternator connector | | | | |

### REMOVAL

1. Disconnect battery cable at negative terminal.
2. Remove alternator drive belt. Refer to EM-11, "Checking Drive Belt" .
3. Remove alternator harness mounting bolt, ground mounting bolt, alternator connector and “B” terminal mounting nut.
4. Remove alternator mounting bolts.
5. Remove alternator bracket.
6. Remove alternator assembly upward.




### ALTERNATOR PULLEY INSPECTION

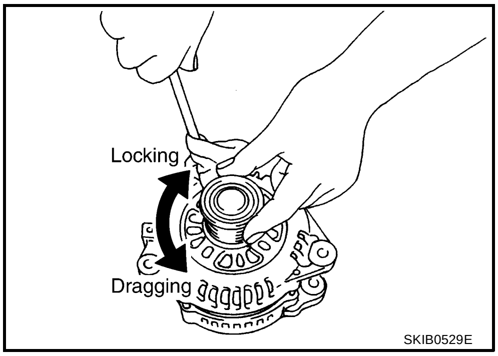
#### One-Way Clutch Pulley Check

Fix rotor with inserting a suitable tool rolled with a cloth.

**CAUTION:**

**Be careful not to damage the rotor.**

1. Check for locking. (Outer ring is turned clockwise when viewed from the front.)
   - If it rotates in both directions... Replace pulley.
2. Check for dragging. (Outer ring is turned counterclockwise when viewed from the front.)
   - If it locks or unusual resistance is felt... Replace pulley.



### INSTALLATION

Note the following, and installation is the reverse order of removal.

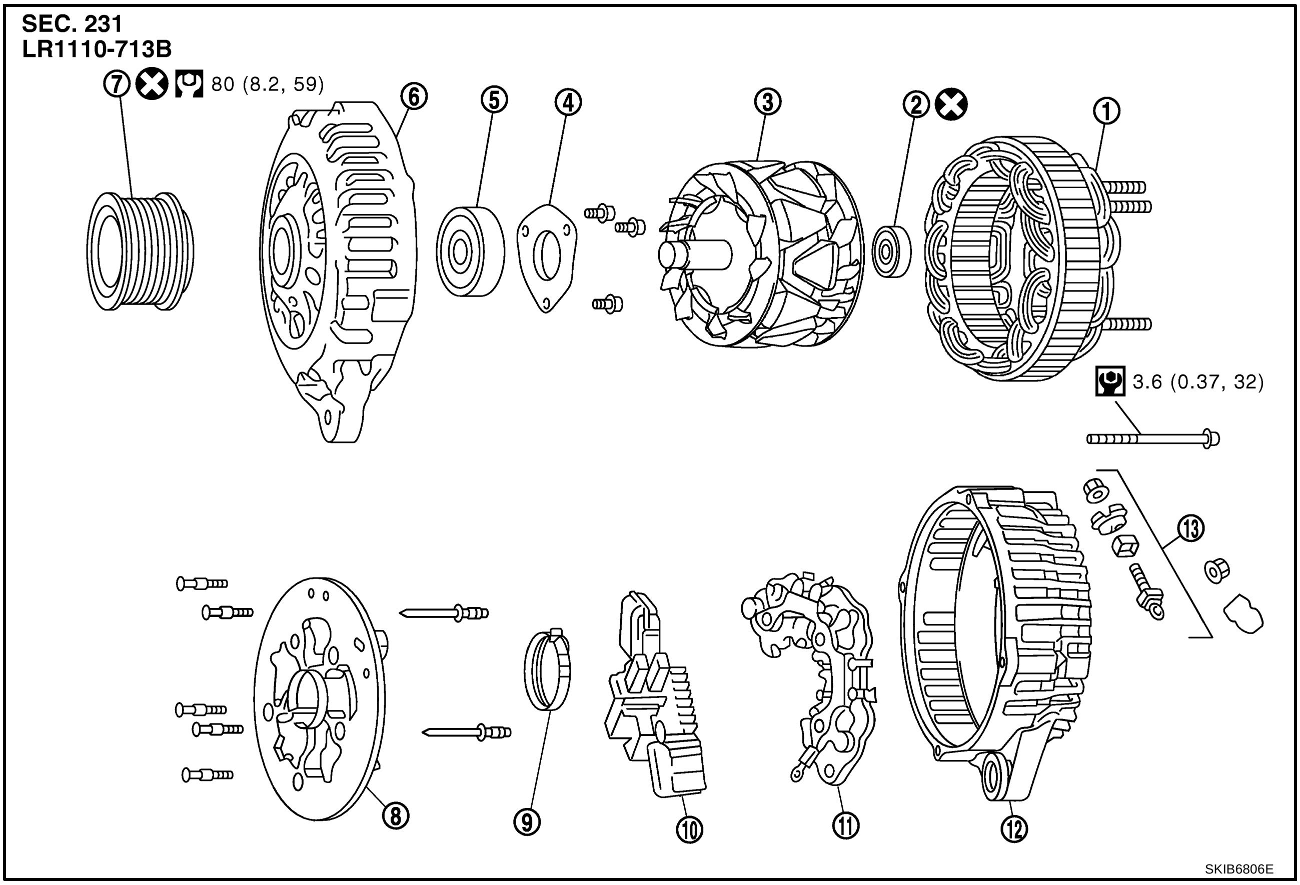
- Install alternator, and check tension of belt. Refer to EM-11, "Tension Adjustment" .

**CAUTION:**

**Be sure to tighten B terminal mounting nut carefully.**

## Disassembly and Assembly

AKS00C3C




| | | | | | |
|---|---|---|---|---|---|
| 1. | Stator | 2. | Rear bearing | 3. | Rotor |
| 4. | Retainer | 5. | Front bearing | 6. | Front cover |
| 7. | Pulley | 8. | Fan guide | 9. | Labyrinth seal |
| 10. | IC voltage regulator assembly | 11. | Diode assembly | 12. | Rear cover |
| 13. | Terminal assembly | | | | |
| | : N·m (kg-m, in-lb) | | : N·m (kg-m, ft-lb) | | : Always replace after every disassembly. |

### DISASSEMBLY FOR ALTERNATOR PULLEY

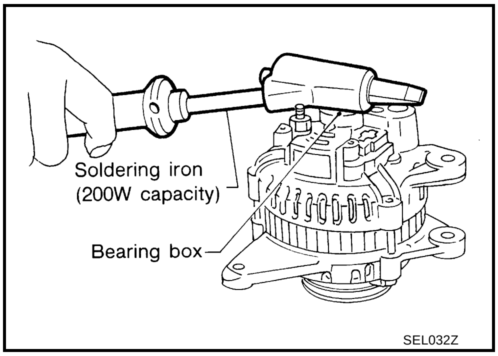
1. Remove through-bolt (4).
2. Remove rear cover.

**NOTE:**

Rear cover may be hard to remove because a ring is used to lock outer race of rear bearing. To facilitate removal of rear cover, heat just bearing box section with a 200 W soldering iron until the temperature increases by about 30 °C.

**CAUTION:**

**Do not use a heat gun, as it can damage diode assembly.**

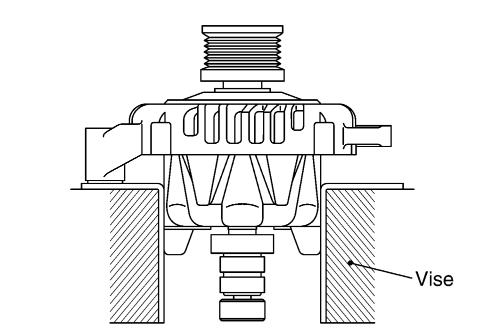


3. Set rotor to the vise.

   CAUTION:

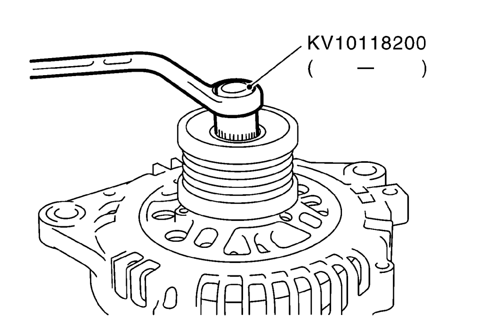
   - **Be careful not to damage the rotor.**
   - **Use copper plate or thick cloth for rotor in the vise.**

4. Remove pulley cap, using suitable tool.



SKIB0531E

5. Remove alternator pulley, using alternator pulley adaptor [SST].



SKIB0731E

## ASSEMBLY FOR ALTERNATOR PULLEY

Assembly is the reverse order of disassemble.

CAUTION:

**Note the tightening torque shown, in the figure.**

# SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00030

## Battery

AKS00B77

| | | |
|---|---|---|
| Applied mode | | QR25 engine |
| Type | | 80D23L |
| 20 hour rate capacity | [V - Ah] | 12 - 62 |
| Cold cranking current (For reference value) | [A] | 589 |

## Starter

AKS00B78

| Applied model | | | QR25 engine | |
|---|---|---|---|---|
| | | | A/T | M/T |
| Type | | | S114-844 | M0T87081 |
| | | | HITACHI make | MITSUBISHI make |
| | | | Reduction | |
| System voltage | | [V] | 12 | |
| No-load | Terminal voltage | [V] | 11.0 | |
| | Current | [A] | Less than 90 | |
| | Revolution | [rpm] | More than 2,700 | More than 2,500 |
| Minimum diameter of commutator | | [mm (in)] | 28.0 (1.102) | 28.8 (1.134) |
| Minimum length of brush | | [mm (in)] | 10.5 (0.413) | 7.0 (0.276) |
| Brush spring tension | | [N (kg, lb)] | 16.2 (1.65, 3.64) | 21.7 (2.2, 4.9) |
| Clearance between bearing metal and armature shaft | | [mm (in)] | Less than 0.2 (0.008) | |
| Clearance between pinion front edge and pinion stopper | | [mm (in)] | — | 0.5 - 2.0 (0.020 - 0.079) |
| Movement in height of pinion assembly | | [mm (in)] | 0.3 - 2.5 (0.012 - 0.098) | — |

## Alternator

AKS00B79

| | | |
|---|---|---|
| Applied model | | QR25 engine |
| Type | | LR1110-713 |
| | | HITACHI make |
| Nominal rating | [V - A] | 12 - 110 |
| Ground polarity | | Negative |
| Minimum revolutions under no-load (When 13.5 V is applied) | [rpm] | Less than 1,100 |
| Hot output current (When 13.5V is applied) | [A/rpm] | (More than 35/1,300)<br>More than 70/1,800<br>More than 91/2,500<br>More than 110/5,000 |
| Regulated output voltage | [V] | 14.1 - 14.7 |
| Minimum length of brush | [mm (in)] | More than 6.0 (0.236) |
| Brush spring pressure | [N (kg, lb)] | 1.0 - 3.43 (102 - 350, 3.60 - 12.34) |
| Slip ring minimum diameter | [mm (in)] | More than 26.0 (1.024) |
| Rotor coil resistance at 20°C (68°F) | [Ω] | 2.16 - 2.46 |